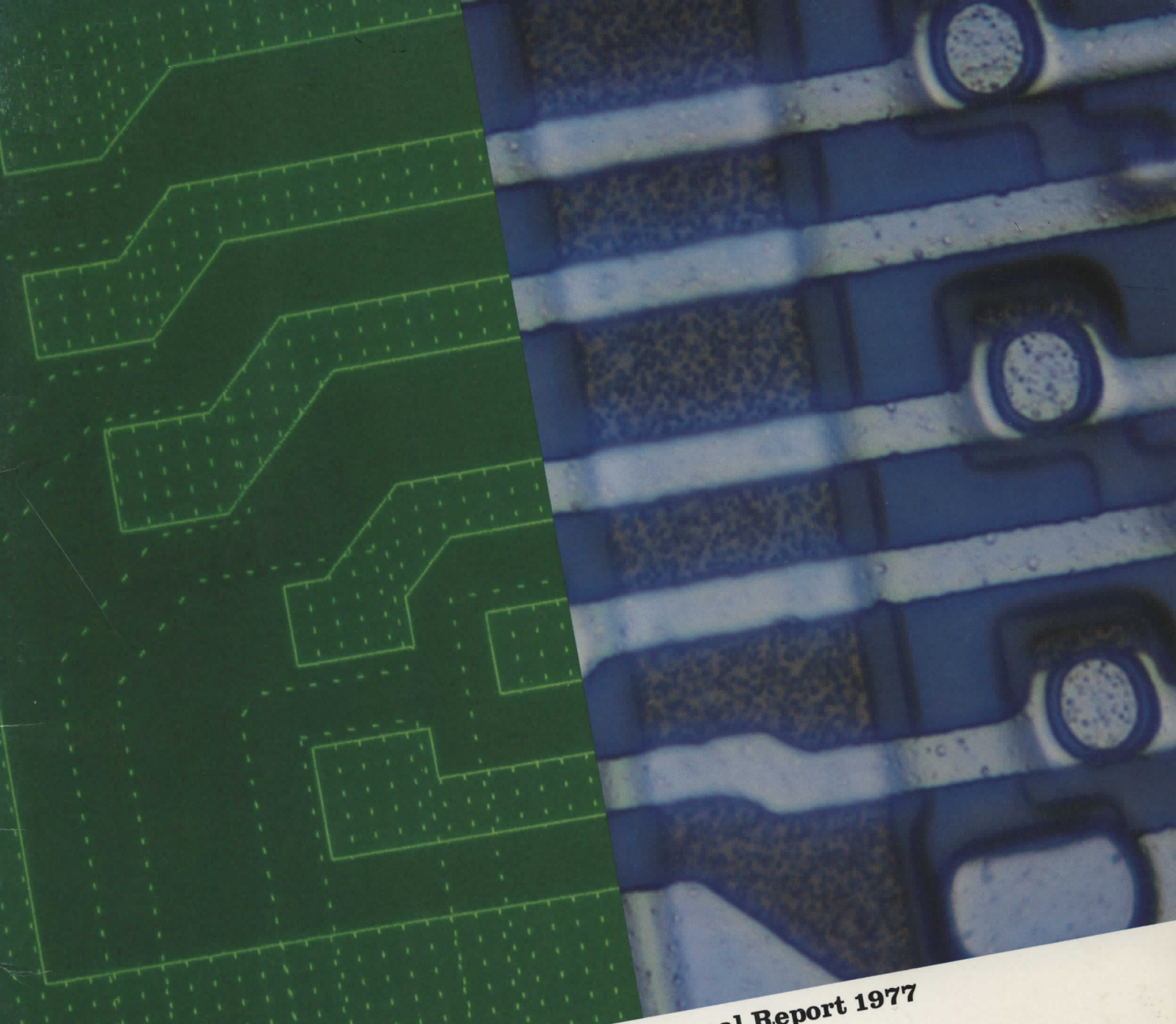
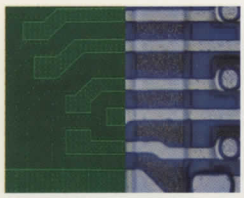


intel® Annual Report 1977



Design and reality. Intel LSI circuits are designed using computer techniques. The CRT image of a small portion of a circuit is shown on the left, a photomicrograph of that portion of the actual device, magnified over 1,000 times, on the right.

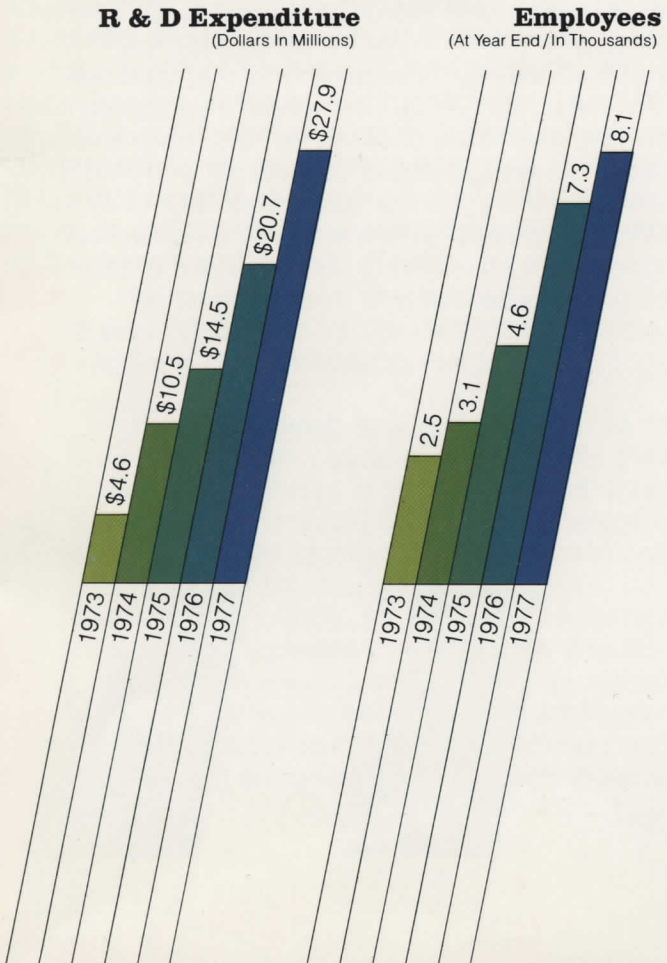
Overview *Since Intel was founded nearly ten years ago, the company has been at the focal point of advanced semiconductor technology, and the expanding use of large scale integrated (LSI) circuits. Since Intel introduced its first LSI device in 1969, a semiconductor memory, the annual market for semiconductor memory LSI components has grown to nearly three-quarters billion dollars. Intel has grown with this market and remains the leading supplier of such components.*

After pioneering semiconductor memory, Intel developed the concept of the microprocessor, or the "computer-on-a-chip" in the early 70's. Microprocessors, now available in several families, have caused a rapid expansion of the use of LSI components by extending electronic solutions to a vast range of new problems. Even for simple chores, such as appliance control, the cost of microprocessors has fallen to a level making them the preferred solution. As a result, applications are expanding rapidly. Intel has led in developing and serving the microprocessor market from the beginning.

Intel's capability in LSI components has opened business opportunities in equipment with high LSI content. The first of these we pursued was complete memory systems for sale both to original equipment manufacturers and to end users. Here again, Intel has become the leading independent supplier of semiconductor memory systems.

A second system-level product opportunity resulted from our development of the microprocessor. A need arose for specialized laboratory equipment to aid our microprocessor customers in the design of microcomputer based systems. As these development systems were put into use, a need developed for specialized instrumentation for production testing and maintenance of that equipment. Finally, standard microprocessor-based computers found ready markets with customers not wishing to design and build their own. Intel has initiated these new markets and remains the major supplier to each of them.

This brief overview demonstrates Intel's basic approach: To serve new markets for integrated electronics created through technology.



Management Report

Intel's revenues and earnings for 1977 were up from the previous year by 25% and 26%, respectively, to new record high levels of $283 million and $32 million, or $2.98 per share. In spite of a record net capital investment of $45 million in facilities and equipment, our balance sheet remains strong with no long-term debt and a significant cash position to finance the future progress of the company.

Demand for Intel's products was generally strong in 1977 with new order bookings accelerating in the fourth quarter. This demand was especially strong in memory components of a variety of types although it included our other products as well. The world's consumption of digital electronic functions in an ever-increasing range of applications continues to grow at a rapid rate and we expect this growth in usage to continue for many years as technical advances allow the production of even lower cost, more broadly applicable electronic functions. As this occurs, we expect the strong competition from other suppliers and rapid decline in prices that we have experienced to continue. Fortunately, cost-reductions through improved technology and productivity of our employees, combined with the rapidly growing number of functions produced, has allowed cost decreases to be roughly commensurate with the price declines. Considerable potential still exists from extension of the technology to decrease the cost of electronic functions, making them more generally useful to society. We consider this prospect as both a challenge and a growing opportunity for Intel to continue to pursue.

During the past year Intel expended significant effort strengthening the foundation for future growth. It was a record year for new product introductions. We expect several of these to be major revenue producers for Intel over the next few years. The introduction of new products requires not only the success of the research, development and engineering programs that create them, but also major contributions from the manufacturing organizations in assimilating new technology and procedures, and from marketing and sales preparing the support and presenting the products to the customers. The record number of introductions required the dedicated support of all our employees and we are proud of the accomplishment.

We made a major step in separating Intel into more nearly self-contained divisions so that we can remain responsive to the needs of our customers as we become larger and more diverse in our products. We are organized now into five product divisions, each containing development, engineering, marketing, and specialized manufacturing. Other functional operations are centralized activities common to several divisions. This organizational structure allows the economies of scale where common requirements exist, combined with the flexibility to respond to rapidly changing requirements that is characteristic of smaller organizations.

During 1977 we moved to diversify our operations geographically. Previously only manufacturing plants and sales offices were located outside the San Francisco Bay Area. Now major engineering and marketing activities are being established near Portland, Oregon. While such moves are expensive and disruptive initially, we feel that they are required to broaden our geographical base for long term growth.

Intel made major progress in memory components during the year. Our new generation of dynamic 4096-bit random-access memory components (4K RAMs) was well accepted and we increased our market share significantly during the year. These memories have proven very cost-effective to the customer and their usage of RAMs has been expanded greatly. Our ability to deliver the newer 16K dynamic RAM during 1977 was less than we had expected as yields remained below planned levels most of the year. As the year closes, however, significant progress is apparent and we look forward to major growth in 16K RAMs in 1978.

A major advance in the performance available with MOS technology was demonstrated by our introduction of high speed static RAMs utilizing Intel's HMOS (for high-speed metal oxide semiconductor) technology. This advanced semiconductor technology and its extensions will be utilized in a variety of our future memory and microprocessor products. Our position in static RAMs was further strengthened by the expansion of production of our slower 4K product that has become an industry standard.

The usage of erasable-programmable read-only memories (EPROMs), a product invented and pioneered by Intel, expanded greatly during the year. Several new suppliers entered the market for 8192-bit EPROMS and products of 16,384 bit complexity were introduced by Intel and a major competitor. As new suppliers attempted to obtain a share of the available market, prices fell precipitously. Intel retains a major market share and a strong commitment to this product area. The lower prices have expanded the demand for this memory function, again demonstrating the great elasticity of memory usage.

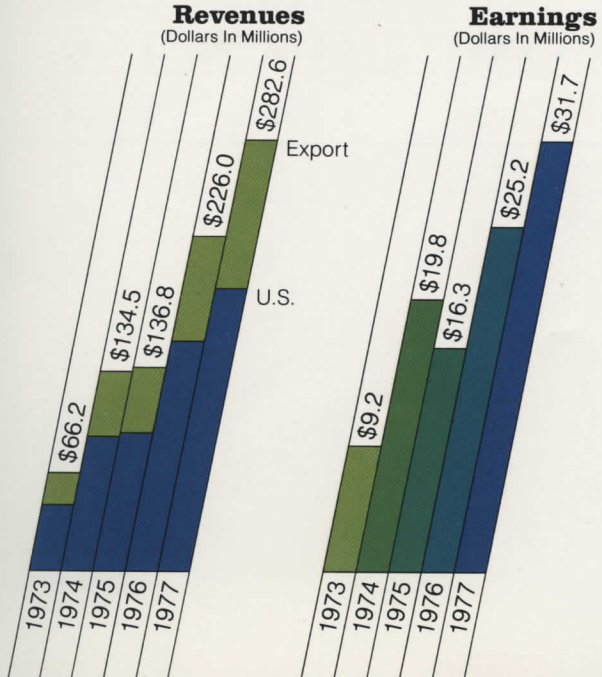
We are expanding our semiconductor processing capability, principally because of the expanding demand for memory and the requirements of new products. A new plant is under construction in Aloha, Oregon, and we are planning to start construction of another in California early in 1978.

Considerable progress was made in developing business relationships with equipment manufacturers for new memory systems to utilize the capacity that was freed upon completion of a major contract the end of last year. The Memory Systems Division has several major programs underway that will grow in 1978 and beyond. Intel's business selling plug-compatible memories for IBM computers remains quite strong with our installed base world-wide now over 700 systems. We are pleased to announce that Mr. William McCalmont has joined Intel as Vice President and General Manager of the Memory Systems Division. He comes to us with several years of successful experience in the computer systems marketplace.

Microcomputers continue to create excitement as they fulfill the promises that have been predicted. Intel remains a leader in both large-scale integrated (LSI) microcomputer components and in board and system level products incorporating them. During 1977, Intel's 8085 microprocessor attained status as an industry standard, with several alternate sources announced world-wide. A major thrust of Intel's activities during the year was aimed at expanding our MCS 48™ family of complete microcomputers in a single chip of silicon. These "low-end" devices are aimed at a wide variety of control applications, several of which offer the possibility of consuming millions of microcomputers per year. We are enthused about our new product opportunity here and expect it to be a major growth area for Intel. The utilization of microcomputer control is still in its infancy. It is difficult to imagine the vast range of important uses that will develop over the next several years.

Microcomputers and the support required for their efficient utilization remain areas of heavy investment by Intel. Beyond the complex components themselves, we supply systems software, development systems for software and hardware, and service test equipment for microcomputer systems. In each of these areas we introduced major new products during the year. For example, the ICE-85™ in-circuit emulator added to our Intellec® development system supports the design of microcomputer systems through the full capability of a logic analyzer as well as the in-circuit emulation offered by our previous ICE modules.

In many ways 1977 was a difficult year, but one in which Intel made significant progress. We abandoned the digital watch and watch module business including the closing of our Microma subsidiary, the transfer of most of the people to other divisions of Intel, and the disposal of Microma's assets. The record number of new products throughout the company, many of high complexity, put a heavy burden on the entire organization. Growth combined with reorganization and the acceleration of geographical dispersion required improved systems for control and outstanding efforts on the part of many Intel managers. Maintaining acceptable margins in a period of unusually rapid price declines depended upon the dedication of all Intel employees throughout the world. We would like to extend our thanks to our employees and suppliers who made it possible and to our customers and shareholders for their continued support of Intel.



Gordon E. Moore
President

Robert N. Noyce
Chairman of the Board

Intel Corporation

Financial Summary

For the five years ended December 31, 1977

	1973	1974	1975	1976	1977
	(Thousands—Except Per Share Amounts)				
Net revenues	**$66,170**	**$134,456**	**$136,788**	**$225,979**	**$282,549**
Cost of sales	35,109	67,909	67,649	117,193	143,979
Research and development costs	4,565	10,500	14,541	20,709	27,921
Marketing, general and administrative expenses	7,347	15,369	21,386	36,620	47,503
Taxes on income	9,935	20,902	16,938	26,243	31,430
Net income	**$ 9,214**	**$ 19,776**	**$ 16,274**	**$ 25,214**	**$ 31,716**
Earnings per capital and capital equivalent share	**$.94**	**$ 1.97**	**$ 1.56**	**$ 2.37**	**$ 2.98**
Capital and capital equivalent shares used in per share calculations	9,762	10,016	10,400	10,621	10,654

Financial Information by Quarter

	March 31	June 30	September 30	December 31
1977	(Thousands—Except Per Share Amounts)			
Net revenues	**$65,726**	**$69,222** (A)	**$73,349** (B)	**$74,252**
Cost of sales	34,122	35,001	36,816	36,740
Research and development costs	6,170	6,587	7,310	7,854
Marketing, general and administrative expenses	10,856	11,772	11,794	13,081
Micrema liquidation reserve (C)	—	—	2,000	(700)
Taxes on income	7,255	7,899	7,681	8,595
Net income	**$ 7,323**	**$ 7,963**	**$ 7,748**	**$ 8,682**
Earnings per capital and capital equivalent share	**$.69**	**$.75**	**$.73**	**$.81**
1976				
Net revenues	**$45,484**	**$50,624**	**$61,879**	**$67,992**
Cost of sales	23,284	25,431	33,189	35,289
Research and development costs	4,753	4,850	5,425	5,681
Marketing, general and administrative expenses	7,272	9,161	9,511	10,676
Taxes on income	5,172	5,678	7,003	8,390
Net income	**$ 5,003**	**$ 5,504**	**$ 6,751**	**$ 7,956**
Earnings per capital and capital equivalent share	**$.47**	**$.52**	**$.63**	**$.75**

(A) Second quarter 1977 includes $850 net proceeds from business interruption insurance.

(B) Third quarter 1977 includes $1,520 net proceeds from the sale of EG&G, Inc. common stock.

(C) The net charge for the Micrema liquidation reserve is classified with cost of sales in the accompanying annual Consolidated Statement of Income.

Management's Discussion and Analysis of the Financial Summary

Net Revenues for 1977 were up approximately $56.6 million (25.0%) from 1976. The increase of 1976 Net Revenues over 1975 was approximately $89 million, or 65%. The dollar increase in 1977 over 1976 is less than the increase of 1976 over 1975 and the rate of growth falls below the historical compounded annual growth rate since 1973 of approximately 40%. As was the case in 1976, the growth in 1977 Net Revenues resulted from significantly increased unit shipments. The growth rate was, however, tempered by rapidly falling prices in certain product areas, reflecting the aggressive competition that exists in many portions of the electronics industry. The historical pattern of Net Revenue growth reflects the fact that the market for Intel's products is growing much faster than is the general economy. The markets which Intel serves tend to change as the technology evolves, resulting in rapid product obsolescence.

Cost of Sales for 1977 was up $26.8 million (22.9%) from 1976. The increase in Cost of Sales followed closely the increase in Net Revenues. Cost of Sales as a percentage of Net Revenues in 1977 was 51.0% as contrasted with 51.9% in 1976 and 49.5% in 1975. These variations reflect the offsetting effects of large price decreases for many products and decreased manufacturing costs. In addition, product mix changed significantly as many new products were introduced which sometimes rendered older products obsolescent.

Research and Development expense was increased $7.2 million (34.8%) from 1976. The increase in Research and Development expense in 1976 over 1975 was $6.2 million (42.4%). As a percentage of Net Revenues, however, Research and Development expense in 1977 was 9.9%, in 1976 9.2% and in 1975 10.6%. To develop the products required to serve the changing needs of our customers, Management believes that it is necessary to devote a sizable portion of our resources to continuing research and development activity. The Company's increased expenditures for research and development principally resulted from the hiring of additional scientists and engineers and the increased cost of supporting our scientists and engineers with the personnel, facilities and equipment necessary to utilize their time efficiently. Management believes that it is necessary to continue research and development activities at levels relating to long-term objectives even in the face of fluctuations in growth in Net Revenues. Thus, even in 1975 when Net Revenue growth over the preceding year was slight, Intel chose to continue to expand its level of research and development activities consistent with the Company's long term objectives.

Marketing, General and Administrative Expenses were increased $10.9 million (29.7%) from 1976. Marketing, General and Administrative Expenses in 1976 were up $15.2 million (71.2%) from 1975. Marketing, General and Administrative Expenses increased as a percentage of Net Revenues in the three years from 15.6% in 1975 to 16.2% in 1976 and 16.8% in 1977. The year by year increase in Marketing, General and Administrative Expenses has been deemed necessary by Management to respond to increased competition and because of increased marketing support required for Intel's line of complex microcomputer products.

Net income for 1977 was up $6.5 million (25.8%) from 1976. The increase in 1976 over 1975 was $8.9 million, or 54.9%. Net Income as a percent of Net Revenues was 11.2% in 1977, 11.2% in 1976, and 11.9% in 1975.

Intel Corporation

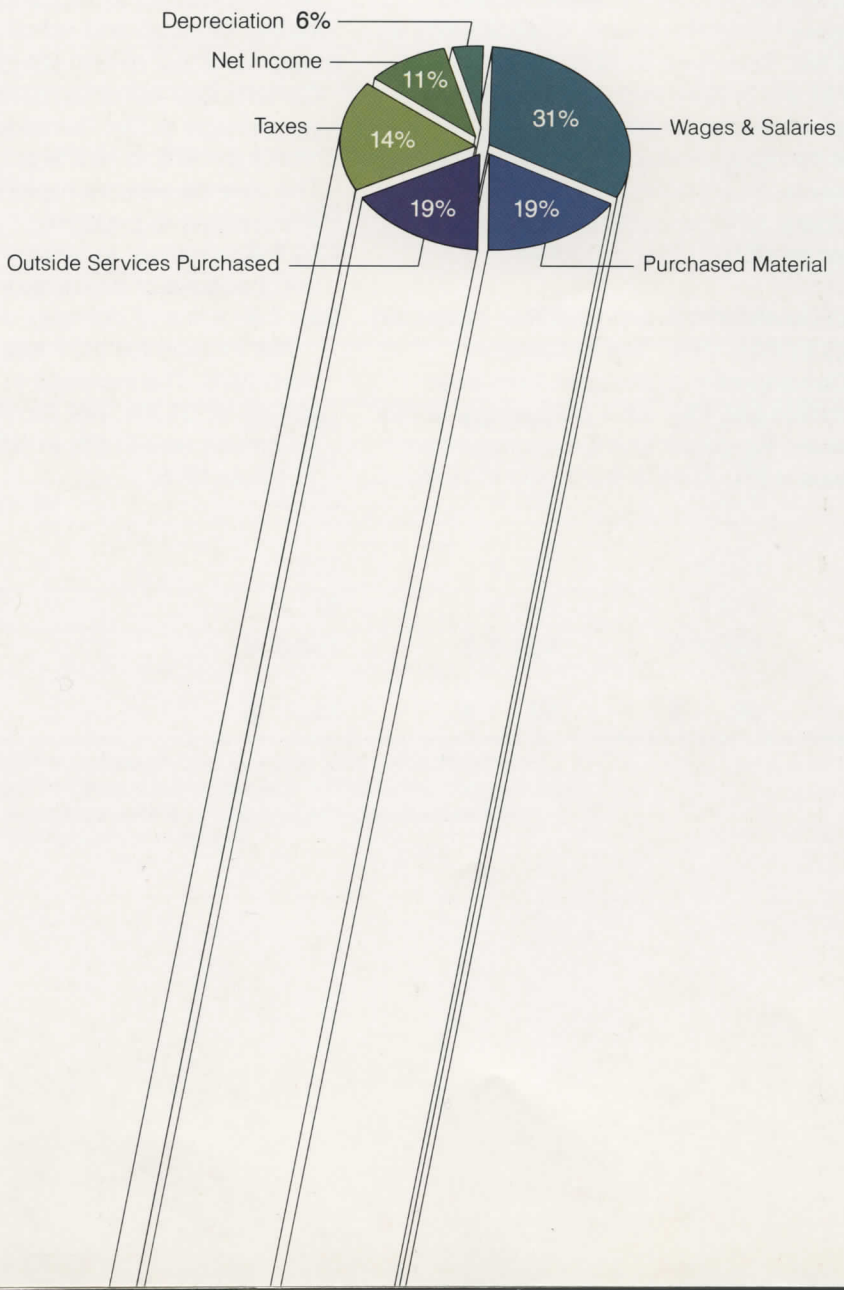
Consolidated Statement of Income

Years ended December 31, 1977 and 1976

	1977	1976
	(Thousands—Except Per Share Amounts)	
Net revenues (Note 1)	**$282,549**	**$225,979**
Costs and expenses (Note 1):		
Cost of sales	143,979	117,193
Research and development	27,921	20,709
Marketing, general and administrative	47,503	36,620
	219,403	**174,522**
Income before taxes on income	**63,146**	**51,457**
Taxes on income (Note 2)	31,430	26,243
Net income	**$ 31,716**	**$ 25,214**
Earnings per capital and capital equivalent share (Note 1)	**$ 2.98**	**$ 2.37**

See accompanying notes.

1977 Revenue Distribution



Intel Corporation

Consolidated Balance Sheet

December 31, 1977 and 1976

Assets	1977	1976
	(Thousands)	
Current assets:		
Cash	$ 5,991	$ 5,260
Short-term marketable interest-bearing investments, at cost which approximates market	33,472	21,123
Accounts receivable, net of allowance for doubtful accounts of $1,710,000 in 1977 ($1,597,000 in 1976)	56,451	44,316
Inventories (Note 1):		
Materials	12,819	10,153
Work-in-process	16,133	12,991
Finished goods	4,725	4,385
	33,677	27,529
Prepaid taxes on income (Note 2)	9,968	5,981
Other assets	1,570	1,290
Total current assets	**141,129**	**105,499**
Property, plant and equipment (Note 1):		
Land and buildings	33,725	24,670
Machinery and equipment	65,261	37,645
Equipment leased to others	6,933	4,055
Construction in progress	4,964	2,328
	110,883	68,698
Less accumulated depreciation and amortization	30,766	17,629
Net property, plant and equipment	80,117	51,069
	$221,246	**$156,568**

Liabilities and Shareholders' Equity	1977	1976
	(Thousands)	
Current liabilities:		
Accounts payable	$ 12,438	$ 9,387
Deferred income on shipments to distributors (Note 1)	14,335	7,646
Accrued liabilities	15,221	10,910
Income taxes payable (Note 2)	17,659	8,742
Total current liabilities	**59,653**	**36,685**
Deferred taxes on income (Note 2)	8,713	8,443
Unamortized investment tax credits (Note 2)	3,938	1,980
Commitments and contingencies (Notes 2 and 4)		
Shareholders' equity (Notes 1 and 3):		
Capital stock, without par value, 20,000,000 shares authorized; shares issued and outstanding—10,318,000 at December 31, 1977 and 10,108,000 at December 31, 1976	58,611	50,845
Retained earnings	90,331	58,615
Total shareholders' equity	**148,942**	**109,460**
	$221,246	**$156,568**

See accompanying notes.

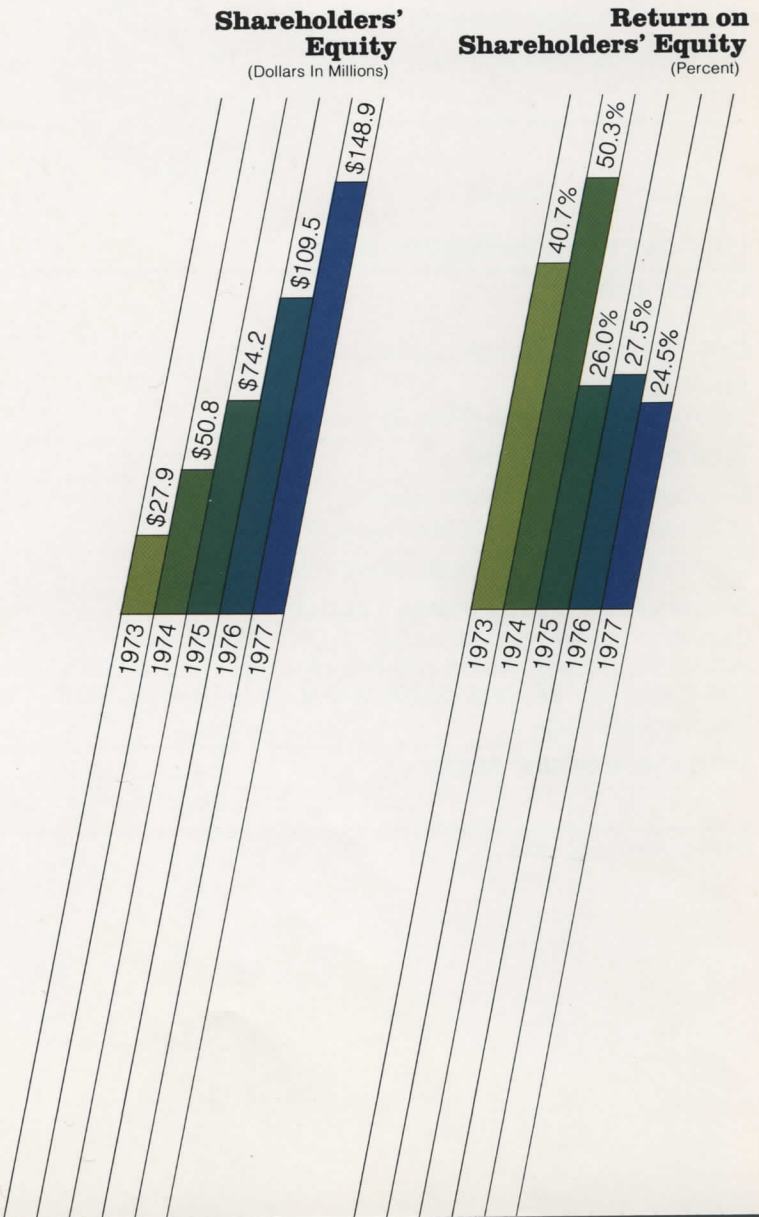
Intel Corporation

Consolidated Statement of Shareholders' Equity

Years ended December 31, 1977 and 1976

	Capital Stock		Retained Earnings	Total
	Number of Shares	Amount		
	(Thousands)			
Balance at January 1, 1976	**9,839**	**$28,289**	**$45,884**	**$ 74,173**
Stock split effected in the form of a 50% stock dividend	—	12,483	(12,483)	—
Proceeds from sales of shares through employee stock participation plans and upon exercise of employee stock options and tax benefit thereof (Notes 2 and 3)	269	10,073	—	10,073
Net income	—	—	25,214	25,214
Balance at December 31, 1976	**10,108**	**50,845**	**58,615**	**109,460**
Proceeds from sales of shares through employee stock participation plan and upon exercise of employee stock options and tax benefit thereof (Notes 2 and 3)	210	7,766	—	7,766
Net income	—	—	31,716	31,716
Balance at December 31, 1977	**10,318**	**$58,611**	**$90,331**	**$148,942**

See accompanying notes.



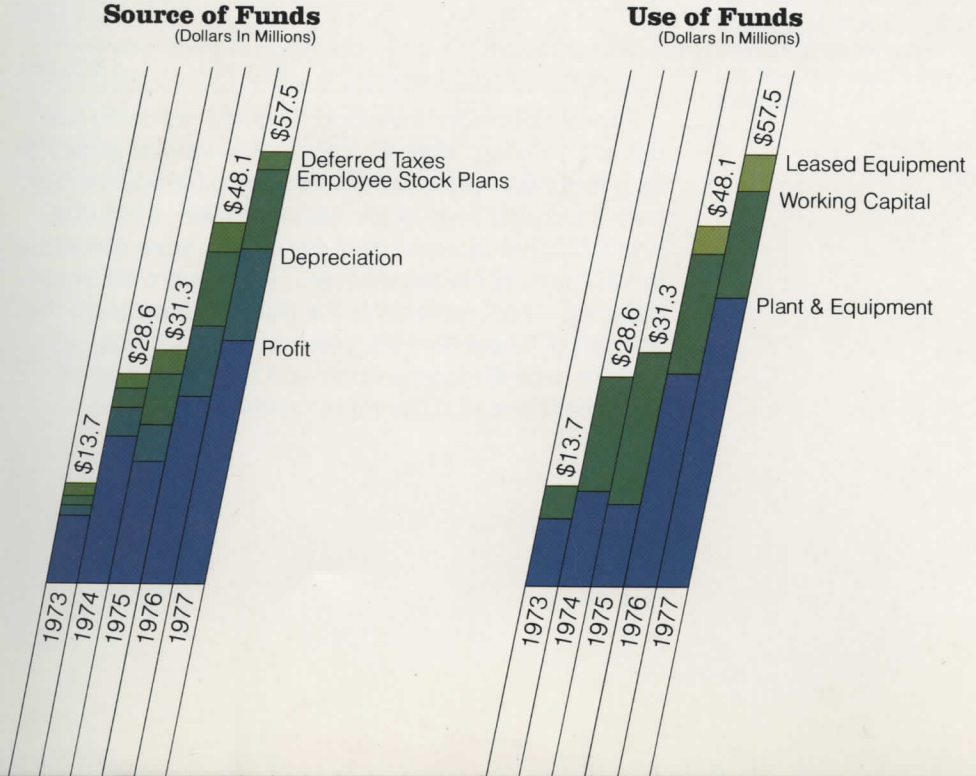
Intel Corporation

Consolidated Statement of Changes In Financial Position

Years ended December 31, 1977 and 1976

	1977	1976
	(Thousands)	
Working capital provided by operations:		
Net income	$31,716	$25,214
Charges to income not involving the current use of working capital:		
Depreciation	15,833	9,478
Noncurrent portion of deferred taxes on income and deferred investment tax credits	2,228	3,326
	49,777	38,018
Working capital provided by proceeds from sales of shares through employee stock participation plans and upon exercise of employee stock options and tax benefit thereof	7,766	10,073
	57,543	48,091
Working capital used for additions to property, plant and equipment	44,881	32,073
Increase in working capital	**$12,662**	**$16,018**
Changes in components of working capital:		
Current assets increase:		
Cash and short-term investments	$13,080	$ 7,090
Accounts receivable	12,135	14,378
Inventories	6,148	7,357
Prepaid taxes on income and other assets	4,267	2,429
	35,630	31,254
Current liabilities (increase):		
Accounts payable	(3,051)	(2,341)
Deferred income on shipments to distributors	(6,689)	(3,095)
Accrued liabilities	(4,311)	(3,260)
Income taxes payable	(8,917)	(6,540)
	(22,968)	(15,236)
Increase in working capital	**$12,662**	**$16,018**

See accompanying notes.



1 Accounting policies

Basis of presentation The consolidated financial statements include the accounts of Intel and all of Intel's subsidiaries after elimination of intercompany transactions. Significant combined financial information as to Intel's foreign operations is as follows:

	1977	1976
	(Thousands)	
Current assets	$31,670	$13,861
Current liabilities	13,225	3,259
Net property, plant and equipment	7,877	4,753

For additional information regarding foreign operations, see Note 5.

Inventories Inventories are stated at the lower of cost or market. Cost is computed on a currently adjusted standard basis (which approximates average or first-in, first-out cost) for work-in-process and finished goods and on a first-in, first-out basis for materials. Market is based upon estimated realizable value reduced by normal gross margin.

Property, plant and equipment Property, plant and equipment are stated at cost. Depreciation is provided principally by use of the straight-line method over the estimated useful lives of the assets for financial reporting purposes (accelerated methods for tax purposes).

Deferred income on shipments to distributors Certain of Intel's sales are made to distributors under agreements allowing right of return and price protection on merchandise unsold by the distributors. Because of the rapid technological obsolescence in the industry, Intel defers recognition of such sales until the merchandise is sold by the distributors.

Earnings per capital and capital equivalent share Earnings per share are computed using the weighted average number of capital and capital equivalent shares outstanding. Capital equivalent shares consist of shares issuable under employee stock option plans (Note 3) computed on the treasury-stock method.

Discontinuance of digital watch operations In the third quarter of 1977, Intel recorded a charge to operations of $2,000,000, which was reduced by $700,000 in the fourth quarter, in connection with the discontinuance of the operations of its digital watch manufacturing subsidiary, Microma, Inc. This net charge is included in cost of sales in the accompanying consolidated statement of income. Microma operations were immaterial to the Company's consolidated results of operations for all years. Digital watch sales were approximately 11% of revenues in 1976.

2 Taxes on income

The provision for taxes on income is made up of the following components:

	1977	1976
	(Thousands)	
Federal:		
Current	$22,372	$19,736
Investment tax credit deferred—net	1,958	1,980
Deferred (prepaid)	(2,848)	(776)
	21,482	20,940
State:		
Current	4,996	4,003
Deferred (prepaid)	(482)	(301)
	4,514	3,702
Foreign:		
Current	6,007	1,601
Deferred (prepaid)	(573)	—
	5,434	1,601
	$31,430	**$26,243**

Intel accounts for investment tax credits using the deferral method, wherein the credits are accounted for as a reduction of the federal provision for taxes ratably over the useful lives of the related assets. $745,000 and $220,000 of investment tax credits were amortized in 1977 and 1976, respectively. "Investment tax credit deferred—net" represents the difference between the amount of investment tax credit used to reduce current federal income taxes and the amount amortized for financial statement purposes.

Deferred and prepaid taxes on income result from timing differences in the recognition of certain revenue and expense items for tax and financial reporting purposes. Timing differences relate primarily to franchise tax accruals, deferred income on shipments to distributors and undistributed income of Domestic International Sales Corporations and foreign subsidiaries.

Income taxes payable were reduced by $3,379,000 in 1977 ($6,242,000 in 1976) as a result of tax deductions arising out of the exercise of non-qualified stock options and disqualifying dispositions of stock acquired under the Company's qualified plans (Note 3).

The Company's income tax returns for 1972 and 1973 and the Company's cost data supplied to the U.S. Customs Service for 1975 are presently under examination by the Internal Revenue Service and the U.S. Customs Service, respectively. Management does not anticipate any material effect upon the results of operations or the financial position of the Company as a result of these examinations.

3 Employee stock option and stock participation plans

Employee stock option plans Under Intel's Non-Qualified Stock Option Plan, officers and key employees may be granted options to purchase shares of Intel's authorized but unissued capital stock at not less than 85% of the fair market value at date of grant. Generally, options become exercisable at the rate of 25% per year commencing one to two years from the date of grant. The options expire ten years from the date of grant. No material charges have been made to income in accounting for options. Proceeds and income tax benefits realized by Intel as a result of transactions in these plans have been credited to capital stock (Note 2).

There are no options outstanding at December 31, 1977 under the Company's Qualified Stock Option Plan. This Plan will be terminated in 1978 and the reduction in options available for grant due to this termination is shown in the accompanying table.

Additional information with respect to employee stock option plans is as follows:

	Options Available for Grant	Outstanding Options		
		Number	Aggregate Value	Price Per Share
	(Thousands—Except Per Share Amounts)			
Balance at January 1, 1976	573	1,115	$21,790	$ 1.36-$57.33
Additional shares reserved for granting under the Non-Qualified Plan	600	—	—	—
Options granted	(377)	377	23,681	$48.00-$77.00
Options exercised	—	(239)	(2,592)	$ 1.36-$51.00
Options cancelled	72	(72)	(2,592)	$ 4.67-$77.00
Balance at December 31, 1976	868	1,181	$40,287	$ 4.67-$77.00
Options granted (a)	(981)	981	40,807	$37.50-$55.50
Options exercised	—	(161)	(2,146)	$ 4.67-$53.00
Options cancelled (a)	691	(691)	(36,965)	$ 4.67-$77.00
Reduction for termination of Qualified Plan	(194)	—	—	—
Balance at December 31, 1977	384	1,310	$41,983	$ 4.67-$68.67
Options exercisable at December 31:				
1977		337	$6,292	$ 4.67-$68.67
1976		278	$4,572	$ 4.67-$65.67

(a) During April 1977 the market price of the Company's capital stock fell to $37.50. Approximately 1,000 of the Company's key employees and officers held outstanding stock options granted pursuant to the Company's Non-Qualified Stock Option Plan which were exercisable at significantly higher prices. In the opinion of management, these options became useless as a motivating factor for key employees and officers. As a result management permitted cancellation of all such outstanding options and granted new options for the same number of shares to such key employees and officers exercisable at the then fair market value, all in accordance with the provisions of the Plan. Such cancellations and reissuances had no material effect on earnings per share.

Intel has reserved 125,000 shares of capital stock which represents management's best estimate of the approximate number of shares that may be issued in connection with a stock compensation plan for certain key employees. Nothing has been earned or charged to income to date under this plan.

Employee stock participation plan Under this plan substantially all employees are entitled to purchase shares of Intel's capital stock at 85% of the fair market value at certain specified dates. Under this plan an aggregate of 450,000 shares may be issued. Employees purchased 49,000 shares in 1977 (30,000 in 1976) for $2,241,000 ($1,239,000 in 1976).

4 Commitments Intel leases a portion of its capital equipment and certain of its manufacturing facilities under leases which expire at various dates through 2033.

Rent expense was $3,092,000 and $2,400,000 in 1977 and 1976, respectively.

The minimum rental commitment under all noncancelable leases with an initial term of one year or more is as follows:

	(Thousands)
1978	$1,539
1979	980
1980	580
1981	430
1982	346
1983 and beyond	1,128

Capital leases entered into prior to January 1, 1977 have not been capitalized in accordance with Statement of Financial Accounting Standards No. 13. If all such noncapitalized financing leases were capitalized, the effect on the financial statements would be immaterial.

Commitments for the construction or purchase of property, plant and equipment total $28,674,000 at December 31, 1977.

5 Industry segment reporting The Financial Accounting Standards Board in December 1976 issued Statement of Financial Accounting Standards No. 14, "Financial Reporting for Segments of a Business Enterprise", which is effective for fiscal periods beginning after December 15, 1976. This Statement requires, among other things, that financial statements include information about a company's operations in different industry segments and about a company's foreign operations.

Intel Corporation and its subsidiaries are engaged primarily in designing, developing, manufacturing and marketing advanced semiconductor large scale integrated circuit components, commonly referred to in the industry as "LSI" components, and computer systems incorporating these components.

Intel's operations outside the United States are involved in assembly and sales. Assembly facilities are maintained in Malaysia, the Philippines and Barbados. Sales subsidiaries are located throughout Western Europe and in Japan. Only the operations of the United States and Western European geographic areas account individually for more than 10% of consolidated sales to unaffiliated customers or total assets.

Information about the Company's operations in different geographic areas at December 31, 1977 and for the year then ended is as follows:

	United States	Western Europe	Other Foreign	Adjustments and Eliminations	Consolidated
	(Thousands)				
Sales and other revenues—					
Unaffiliated customers	$234,460	$27,999	$16,645	$ 3,445	$282,549
Within Intel	25,389	3,099	12,274	(40,762)	—
Total revenue	$259,849	$31,098	$28,919	$(37,317)	$282,549
Operating profit	$ 54,394	$ 9,345	$ 3,562	$ 3,032	$ 70,333
General corporate expense					7,187
Income before taxes on income					$ 63,146
Identifiable assets	$145,967	$14,831	$24,760	$ (296)	$185,262
Corporate assets					35,984
Total assets at December 31, 1977					$221,246

Transfers between geographic areas are accounted for at amounts which are generally above cost and are consistent with rules and regulations of domestic and foreign taxing authorities. Operating profit is total revenue less operating expenses. In computing operating profit, none of the following items has been added or deducted: general corporate expenses and income taxes.

Identifiable assets are those assets of the Company that are identifiable with the operations in each geographic area. Corporate assets are principally cash, short-term investments, and prepaid taxes on income.

Of the $234,460,000 of United States sales to unaffiliated customers, $47,795,000 were export sales principally to Western Europe and Canada ($40,072,000 and $4,757,000, respectively).

6 Quarterly information The unaudited quarterly information for the years ended December 31, 1977 and 1976 is presented on page 4 of this 1977 Annual Report.

Report of Certified Public Accountants

The Board of Directors and Shareholders
Intel Corporation

We have examined the accompanying consolidated balance sheets of Intel Corporation at December 31, 1977 and 1976 and the related consolidated statements of income, shareholders' equity and changes in financial position for the years then ended. Our examinations were made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

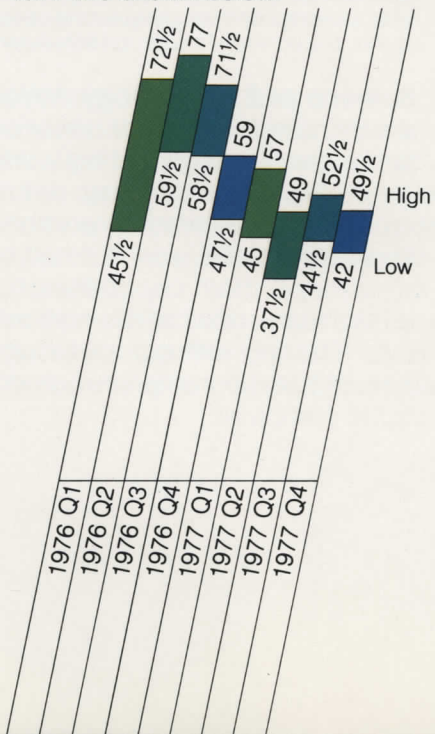
In our opinion, the statements mentioned above present fairly the consolidated financial position of Intel Corporation at December 31, 1977 and 1976 and the consolidated results of operations and changes in financial position for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis during the period.

Arthur Young & Company

San Jose, California
January 12, 1978

Company's Stock

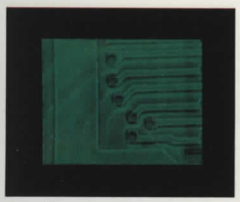
Intel stock is traded in the over the counter market and is quoted on NASDAQ and in the Wall Street Journal and other newspapers. Intel has never paid cash dividends and has no present plans to do so. The quarterly bid price ranges for the years 1976 and 1977 are shown below.





Computer aids are used in the design of all Intel circuits. Shown here is a portion of the 2147 high speed 4K static RAM. Using the CRT, the designer may enter and modify the geometry of the masks which will produce the final device. The portion of the design shown corresponds to a final chip area of approximately 4 mils X 5 mils.

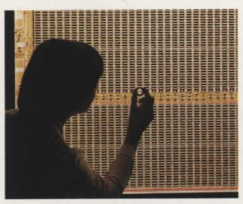
Science and Technology *Advances in semiconductor devices have resulted from a continuing search for better understanding of the properties of semiconductors and extensive engineering work to put this knowledge to practical application. The tools used to expand this understanding, or to aid in product design, are often the result of the advances in electronics. Shown above is a portion of a circuit as it is being designed using a computer graphic display on a television-like cathode ray tube, and the final device as shown by a scanning electron microscope. Both capabilities have resulted from advances in electronics. Computer graphics is but one of the many uses of the computer in the design and production cycle of large scale integrated (LSI) circuits. Starting with computer simulation of the circuit to be designed and ending with computer controlled testing of the completed devices, the entire manufacturing process utilizes the capabilities of the digital computer.*



A Scanning Electron Microscope (SEM) is necessary to analyze the small geometries used in advanced LSI. This SEM photo of an actual 2147 4K RAM, corresponds to the same geometries shown on the computer aided design system opposite. The magnification is approximately 1300.

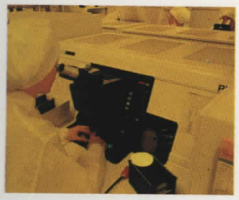
Progress in the technology of LSI electronic devices has continued to allow the production of ever more complex circuits at approximately the same cost, or with rapidly decreasing cost per function. This has been accomplished by making the individual transistors so small that many essential features can be seen only by the electron microscope. Besides making the electronic functions less expensive, smaller dimensions allow the circuitry to operate faster, improving the capabilities of the end product, use less power, reducing the amount of cooling required and often allow the equipment to be portable.

The circuit shown is Intel's 2147 which employs the high speed silicon gate process (HMOS) introduced in 1977. This is an extension of the silicon gate process introduced by Intel in 1969. This new technology has made possible MOS devices which are comparable in speed to earlier bipolar devices at much lower power consumption and cost.



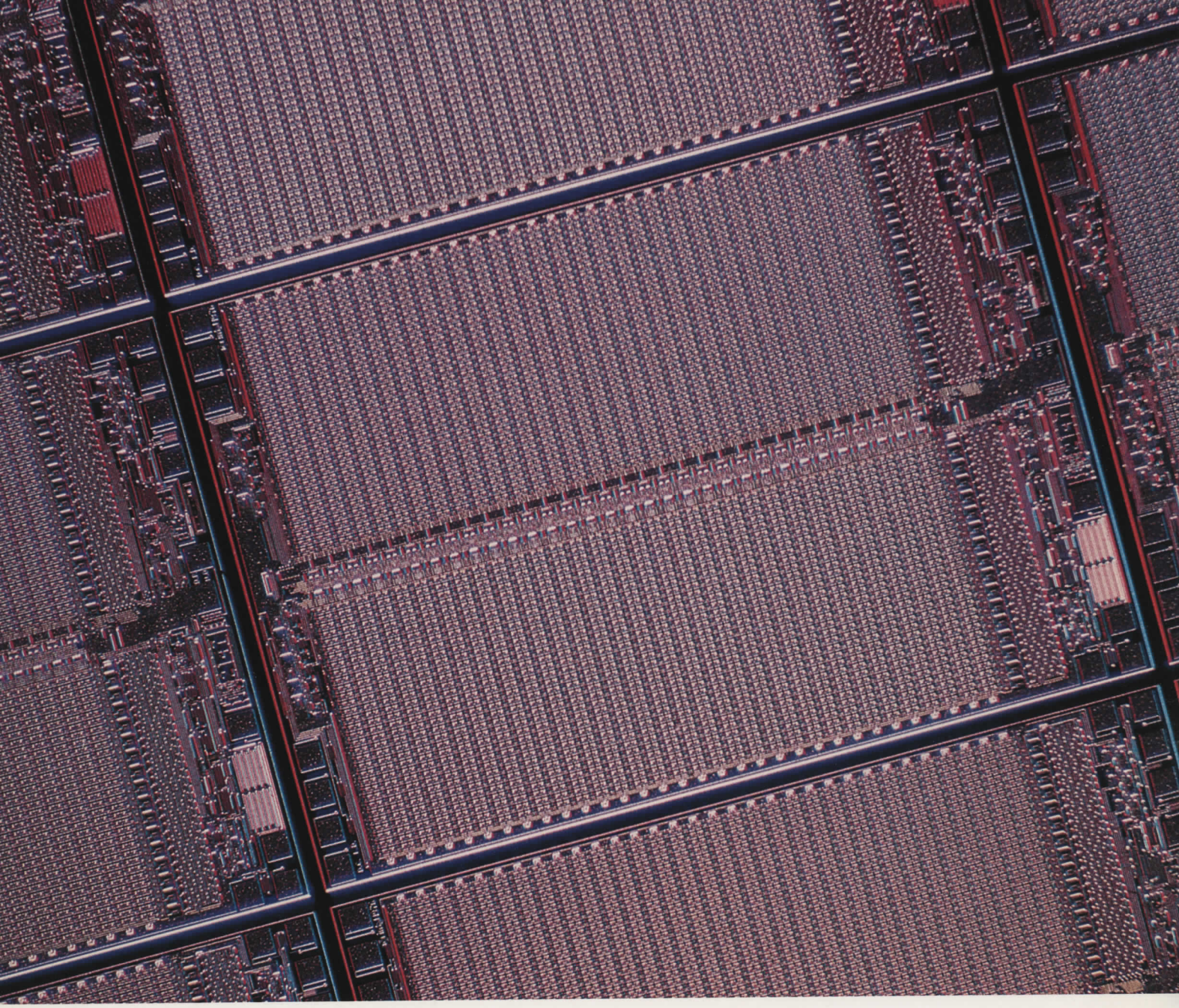
Individual masks, typically seven to ten levels, are utilized in the manufacture of MOS integrated circuits. The accuracy and registration of all levels is critical. Here they are checked at 200X final size.

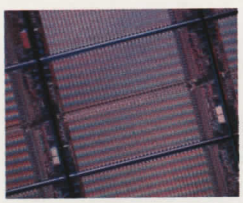
It is necessary to understand the applicable principles, processes, and technology in order to bring new LSI products into high volume production. As an example, consider the new Intel 2716 16K erasable programmable read-only memory (EPROM) introduced this year. The basic operating principle of this device depends upon the passage of electrons through a usually insulating layer of silicon dioxide to write the information in the memory. However, the data retention of this device depends upon having a nearly perfect silicon dioxide coating around a floating electrode which is charged by this process. Yet, ultra-violet light must be able to discharge the electrode to erase the memory. Thus, the metallurgy and chemistry involved in processing must be very tightly controlled. New processes were needed to allow double layers of polysilicon to be used to charge the floating gate, and to allow high voltages to be used for programming while maintaining adequate speed during operation with a single 5 volt supply. The combination of these several disciplines has allowed a significantly advanced product to be offered: A 5 volt 16K bit EPROM. This technology is incorporated in other products including the reprogrammable single component microcomputer, the 8748.



Masks containing the geometric patterns repeated to cover an entire wafer are used to expose photoresist during wafer fabrication. The operator must assure that the pattern registers with previous patterns to within one micrometer (about 40 millionths of an inch).

There is a continuous interaction between circuit requirements, basic science, and process technology. Advances come at the confluence of all; and the development program must consider all. Progress has been evolutionary, but the accumulated effects can be rightfully called revolutionary. Quantitative changes finally result in a perceived qualitative change. The average number of transistors in the eleven LSI memory components and the ten microcomputer components Intel introduced in 1977 was greater than the number of vacuum tubes in the early electronic computer, EINAC, which was the most complex piece of electronic equipment built just 30 years ago. Bringing the enormous logical power of that machine into the economy at a cost of a few dollars is indeed creating a qualitative change in the lives of each of us.





Hundreds of LSI devices are fabricated on a silicon wafer. Here the complexity of a single 2147 becomes apparent. Over 25,000 MOS transistors are contained in every device. The actual size of each 2147 chip is about this big ■.

Technology and Production *The principal motivation to develop even more highly integrated electronics has been to lower costs. This objective can be realized only in an efficient manufacturing organization, which requires the same level of sophistication in a multidisciplined organization as does the development activity. Selecting the appropriate science and technology to find the most cost-effective method of realizing the final product is engineering in its highest form.*

As processes have become more complex, the production facilities have increased in sophistication, causing the industry to become more capital intensive. Recently installed wafer processing facilities have a capital cost in excess of $30,000 per employee and this cost is rising rapidly. Since it now requires nearly three years to bring such a facility on line, long range planning of markets to be served and projections of market penetration must be quite accurate to avoid either missing opportunity for lack of capacity or unnecessary commitment of capital to idle resources.

While our fourth wafer fabrication facility is being brought on-stream, the fifth is in construction in Oregon. Another fabrication facility is being expanded and two more are in the planning stage.



Microprocessor controlled bonding machines are used to complete the packaging of a device. A skilled operator performs the bonding operation once; the auto bonder remembers this "programming" and automatically bonds subsequent devices. The final packaged 2147, complete except for lid and final testing, is shown in the upper right.

Component assembly operations to serve the world-wide market have been done, in large part, in overseas locations. Even here, however, the increase in productivity and resulting lowering of costs has made it feasible to use microcomputer controlled automatic equipment. Even so, our overseas operations have expanded during 1977 with the construction of a new plant in Manila to house a growing work force and the establishment of a new assembly plant in Barbados.

Our philosophy in overseas plants has been to train local employees to take over the management of these facilities. Although several U.S. personnel are involved in the build up of the Barbados facility, the number of U.S. manufacturing personnel in the Far East has been reduced to one. This approach has been highly successful, and high productivity and good morale have been the result.

Representatives of the work force in Malaysia and the Philippines were brought to visit our headquarters during Intel's 1977 annual meeting in order to emphasize the importance of these groups to Intel's overall objectives. This move met with a great deal of enthusiasm.



The Intellec® Development System is used for microprocessor based system design and checkout. Here a system is being utilized at Intel in the design of new single board microcomputers.

The Microcomputer Division was divided late in 1977 to form two new divisions, the Microcomputer Components Division and the Microcomputer Systems Division, due to the increasing importance of these activities within Intel.

During the year Intel introduced several important new microcomputer components extending the family of cost-effective single-chip microcomputers. These include the first EPROM programmable interface device, the 8741, and the low cost 8021 as well as an extended memory version of the 8048, the 8049. In addition, the 827X series of sophisticated peripheral circuits were introduced. This series includes a floppy disk controller, a SDLC protocol controller, a programmable CRT controller, and a programmable keyboard display interface. Each of these devices contain over 20,000 transistors and exceed the functional complexity of the microprocessor itself. Intel continues to have the broadest range of microprocessors and peripheral circuits in the industry, many of which have been accepted as industry standards.



The Intel single board computer line has become the industry leader in this field in less than two years since its introduction. Fourteen new SBC board types were added in 1977, including the SBC 80/04, an 8085 based microcomputer available for under $100.

Design work on the next generation 8086 mid-range microprocessor family is complete, and these products will be introduced using the new HMOS process in 1978. These products will again significantly increase the microprocessor's capability, extending its range of performance and applicability.

The Microcomputer Systems Division provides design aids for designing microcomputer based systems as well as a variety of single board computers, accessories and complete microcomputer systems, production and field test equipment, and software required for microcomputer systems.

The Intellec® microcomputer development system has sold at an accelerated rate as more customers have committed new products to the microprocessor approach, and have realized that a development system is an essential tool for the designer. The capability of the systems has been enhanced through greater disk storage capacity and introduction of in-circuit emulators (ICE) for the new microprocessors.



Intel is the leading supplier of microprocessor development and test systems. The Intellec ICE-85™ in-circuit emulator, shown on the left, is utilized during development of 8085 based systems. ICE capability is available for most Intel microprocessors. The recently announced μSCOPE™ 820 system console provides production test or field service capability for microprocessor based systems.

An important new area of activity has been initiated with the μSCOPE™ microprocessor system console for trouble shooting or testing microprocessor based systems in production, lab, or field repair. Its availability further enhances the total savings for the manufacturer of microprocessor based systems.

As microcomputers are used more widely, and in sophisticated multiprocessor and multitasking systems, more sophisticated software has been required. Intel continues to increase its rate of investment in software, which often is important in the customer's design decisions regarding which microcomputer products to use. A significant accomplishment for the year was the introduction of the RMX 80™, a real-time multi-tasking executive for use with single board computers.



Intel Memory System Division products utilize advanced components to produce plug-compatible add-on memories. Shown above, from left to right, are add-on memories for IBM 370-125, the 370 Family Memory System, 370-158, and 370-168. The newly introduced in-7700 370 Family Memory System provides additional memory for 370 models 135, 138, 145 and 148.

The Memory Systems Division has continued the expansion of its product line, both as a supplier of memory systems to original equipment manufacturers and plug-compatible memories to end users. During the year, seven new OEM systems were introduced, most using newly developed memory components. In this way, the division has served as a test bed for debugging new memory components as well as a conduit through which memory components are sold. In addition, four new plug-compatible memories were introduced, and we now offer the industry's most complete line of add-on memories for the IBM 370 series.

The systems expertise of the division has been building steadily. As a result, several major new OEM contracts have been received which have much more than replaced the major OEM contract completed early in the year.

The division has also built a major asset in a direct marketing and sales organization serving the end user. At year end, our IBM add-on memory system installed base had grown to over 700 systems world-wide.



Kristian Kirks Telefonfabriker of Denmark utilizes the 8048 single component microcomputer in their new generation telephone shown on the left. Fifty commonly called telephone numbers can be stored; thereafter they may be called by one or two key strokes. Telephone numbers called or stored are displayed for viewing.
The Coby 1™ home control center, shown on the right, manufactured by Energy Technology of Las Cruces, New Mexico, illustrates the new market possibilities using microprocessors. This under $400 system is based on the 8085 microprocessor, 2114 4K RAM and 2316E 16K ROM. It provides timing and control of lights and appliances throughout a home; control signals are transmitted over the home's existing power lines so that no additional wiring is required.

1977 was a year of record new product introductions which has positioned us with superior 4K and 16K RAMs as well as the highest speed and lowest power RAMs, the most advanced EPROM, the widest selection of add-on memories, and the widest selection of microprocessors and microcomputer products. This has been accomplished by the dedicated efforts of the entire staff of Intel, and the coordinated efforts of the scientists, engineers, production, marketing, and sales staff; and has been financed from internally generated cash. We believe that we are well on the way to reaching our 1980 sales goal of $500 million at 10% profit on sales.

LSI is penetrating nearly every facet of our lives, and the markets which have been foreseen are now being realized in the home, auto, office and in the communications between them. Opportunities seem nearly unlimited and ask only that the investment be made to develop them.

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Chairman

Arthur Rock*†
Vice Chairman; General Partner of Arthur Rock & Associates, venture capital investors

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Senior Vice President, Intel Corporation

Andrew S. Grove
Executive Vice President and Chief Operating Officer, Intel Corporation

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President of Arbor Laboratories, manufacturer of electronic instruments

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Senior Vice President of International Telephone and Telegraph Corporation, manufacturer of telecommunications equipment

Sanford Kaplan†
Director of Xerox Corporation, manufacturer of copying and office equipment

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Max Palevsky
Industrialist

Charles E. Young
Chancellor of the University of California at Los Angeles

*Member of the Executive Committee
†Member of the Audit Committee

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President and Chief Executive Officer

Robert N. Noyce
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Andrew S. Grove
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William S. McCalmont
Vice President and General Manager, Memory Systems Division

Leslie L. Vadasz
Vice President and General Manager, Microcomputer Components Division

Transfer Agent and Registrar

Wells Fargo Bank
San Francisco, California;
Wells Fargo Securities Clearance Corp.
New York, New York

Certified Public Accountants
Arthur Young & Company
San Jose, California

Corporate Headquarters
3065 Bowers Avenue
Santa Clara, California

Facilities
Aloha, Oregon
Barbados, West Indies
Cupertino, California
Haifa, Israel
Livermore, California
Manila, Philippines
Mountain View, California
Penang, Malaysia
San Jose, California
Santa Clara, California
Santa Cruz, California
Sunnyvale, California

Form 10-K
If you would like to receive, without charge, when available, a copy* of the corporation's "Form 10-K" which will be filed with the Securities and Exchange Commission prior to March 31, 1978 for the 1977 year, please send your request to:
Roger S. Borovoy, Secretary
Intel Corporation
3065 Bowers Ave.
Santa Clara, Ca. 95051.
*No exhibits will be sent unless specifically requested. (There will be a nominal charge for exhibits.)

Annual Meeting
The Intel Annual Meeting of Shareholders will be held April 12, 1978, at the Mediterranean Center of the San Jose Hyatt House, 1740 N. First Street, San Jose, California.

intel®